# Method for coating uneven bases with thin coating materials and a layer support manufactured thereby

The invention relates to a method for coating uneven bases, especially surfaces of wooden materials, with thin coating materials to form a flat and uniformly smooth surface, wherein the support and the coating components are pressed against a smooth metal sheet, laminating rollers, structural strips or the like, and a layer support, consisting of a support material and a coating material manufactured using such a method.

Various methods have been known for a long time for treating workpieces with uneven bases, especially made of wooden materials such that their exterior acquires a surface which is as smooth as possible.

Here mention should first be made of the so-called polish and varnish treatment in which the more or less rough workpiece surfaces are to be treated by expensive and costly treatment measures such as for example polishing, smoothing and coating with multilayer (and therefore very expensive) surface materials. These surface materials can, for example, comprise varnishes which are applied in large quantities to fill defects and achieve corresponding surface smoothing. It is also known, as is described for example in EP 1 010 730 A1 to use a filler made of

wood flour, resin, inert materials and a cellulose solution for filling in order to reduce the price for the surface materials acting as fillers. Finally methods are also known whereby workpieces are coated with thin films, especially decorative films, to improve the aesthetic effect of such workpieces.

It is clear that the expenditure on surface treatment always depends on the surface quality of the material to be smoothed or to be coated. In the case of wooden materials, a distinction can be made according to the following starting materials:

a) Chipboards for general purposes such as furniture or interior work, gross density: between 600 and 680 kg/m$^3$,

b) Chipboards for FPY coating boards with particular dense coating layers, gross density: between 700 and 750 kg/m$^3$.

c) Chipboards for FPO structural boards for floors, walls and roofs, gross density: about 750 kg/m$^3$.

d) So-called 'OSB' (Oriented Structural Board), a product of long chips which are either only longitudinally

oriented single-layer or strewn crosswise with a transversely lying middle layer. They are statically calculable products for the building industry in the form of stiffening boards, gross density: between 400 and 650 kg/m$^3$.

e) Wood fibre hard boards for back walls, drawer bottoms or mouldings, gross density: about 1000 kg/m$^3$.

f) MDF boards (MDF - medium density fibreboard), as medium-density products, gross density: around 850 kg/m$^3$. The density spread lies between 600 and 900 kg/m$^3$, with the designation 'LDF' for 'low density fibreboard' and 'HDF' for 'high density fibreboard'.

g) Plywood with fibre profile crossed by 90° per layer, gross density about 400 kg/m$^3$.

h) Solid wooden blockboards veneered with plywood or strip plywood. These high-quality boards are only used for high-quality furniture construction because of their good bracing-free standing capacity.

Whereas MDF boards and chipboards have a sufficient to good surface smoothness so that they can be constructed in subsequent process steps also using thin coating materials to give an acceptable, smooth and uniform surface, the other said wooden materials have a more or less rough surface according to their structure which can only be smoothed by the expensive processing measures specified further above.

Taking this as the starting point, it is the object of the present invention to develop and further develop the method of surface smoothing specified initially and described in detail previously and the layer support manufactured thereby such that even materials with rough surfaces can be reliably and inexpensively smoothed. Furthermore, it is desirable that even materials having a lower gross density which hitherto could not be used for furniture construction or interior work, can enter this market segment under economic conditions.

This object is solved with regard to the method by using as coating material a covering layer film and an adhesive system which imparts to the covering layer film during coating properties of filling and spanning defects of the material to be coated by chemical/physical reactions.

With regard to a corresponding layer support, the solution of the problem consists in the fact that the coating materials have an adhesive system and a covering layer film and that the adhesive system contains fillers which fill and span defects of the material to be coated by chemical/physical reactions.

According to the invention, an expensive and laborious processing before and during the coating with varnishes or other surface materials can be dispensed with.

According to a further teaching of the invention, the coating can take place under high pressure, preferably at a pressure of $1 \cdot 10^5$ Pa to $6 \cdot 10^6$ Pa (1 to 60 bar). For better reaction of the adhesive system located under the covering layer film the coating can take place at elevated temperature, preferably at a temperature of 150 to 170° C.

According to a further embodiment of the invention it is provided that the duration of the adhesion at elevated pressure and/or at elevated temperature is 5 to 300 sec.

For better curing of the coating another teaching of the invention provides that the curing also takes place after the

coating at room temperature or at an elevated temperature. A temperature range of 20 to 200° C has proved suitable here.

In this situation the surface according to the invention can be manufactured continuously or discontinuously.

For the layer support according to the invention, according to a further teaching of the invention a foaming adhesive can be used as the adhesive system. Wet adhesives having the following base polymers can be considered for this purpose:

PVAc, EVAc, PUR, acrylates, styrene acrylates, styrenes, styrene butadiene, UF, MF, resorcin, phenol, PVa or mixtures thereof as well as natural and synthetic rubber, epoxy resins, wherein the base polymers can acquire a higher cohesivity via a chemical cross-linking such as for example with isocyanates (single-component, two-component) or reactively single-component.

In a further preferred embodiment of the invention, the adhesive system located between the covering layer film and the support material (workpiece) consists of a duroplastic dry gum adhesive or a corresponding dry gum film. In this situation, this can for example be a melamine-impregnated overlay paper which, for coating, is applied to the surface of the workpiece to

be smoothed and is pressed against a corresponding pressing sheet for a predetermined time under pressure and temperature. In this case, good spanning is achieved.

Alternatively, it is also feasible to use a thermoplastic dry gum adhesive or a corresponding dry gum film as the adhesive system located between the covering layer film and the workpiece. This can, for example, be EVA hot melt systems (EVA = ethylene vinyl acetate), systems based on polyurethane or polyolefin. Dispersion-impregnated or duroplastic impregnated papers or thermoplastic films made of polyethylene (PE) or polypropylene (PP) can also be used for this purpose.

According to a further teaching of the invention, the adhesive system can have chemically expandable contents wherein during the coating process a degassing or foaming occurs as a result of chemical/physical reactions which has the result that released gas (for example, $CO_2$) acts as propellant gas which carries solid particles (fillers or polymer particles) from the starting polymer into the defects present on the workpiece surface (indentations and unevenness) which are thereby filled.

In this case it is possible that the application of the adhesive system takes place either a) onto the base to be coated,

b) by spraying/application to the back of the film or c) by transfer of a dry gum layer.

The covering layer films preferably consist of paper with different impregnation such as for example starch gums, resin gums, urea acrylate systems, melamine systems, dextrines, polyvinyl alcohols or the like.

The covering layer film to be used preferably has a weight per unit area of 30 to 500 $g/m^2$ and the adhesive coat has a weight per unit area of 20 to 300 $g/m^2$. The filler content is between 5 and 70%.

The chemical/physical reaction for releasing the propellant gas can also take place under the action of acid donors, wherein preferably the acid donor is supplied liquid or dry, either by spraying on, rolling or by superposition from the back of the film or the top of the base.

It is also possible to use a masked (encapsulated) acid which is incorporated in the adhesive and under pressure and/or temperature loses its protection but also its pH drop in the adhesive system releases either $CO_2$ or other gassing materials. Both inorganic and organic acids can be used as acids.

Finally it is also possible to stir an acid into the then gassing adhesive directly before application of the adhesive and apply this expanded-material-containing adhesive like a foam onto the base to be filled and then carry out the film coating.

Furthermore it is also possible to achieve the expanding/foaming and thereby filling effect of a gum join by additives known in the literature such as, for example

- azo/diazo compounds
- polyurethane
- carbonates and many more.

When used in a small quantity, the adhesive systems used already show the decisive advantage that they can fill or span the hollows or defects of the wooden boards and in conjunction with the thinnest possible films especially matched to these requirements, produce good spanning and smooth surfaces.

Using the method according to the invention, for example, OSB materials can be treated such that they are superior in quality to other materials on the market such as chipboards or MDF boards. As a result of a significantly lower weight of 400 to 600 $kg/m^3$ and other physical properties such as a very high

bending strength, high drilling strength/drill extraction strength and their significantly lower swelling behaviour, they can easily be used for furniture or interior work.

An example of a formulation of an adhesive system of a layer support according to the invention is as follows:

| | | |
|---|---|---|
| UF resin | : | 10 - 70 wt.% |
| PVAc dispersion | : | 10 - 70 wt.% |
| EVAc dispersion | : | 10 - 70 wt.% |
| Cross-linking agent | : | 0.1 - 5.0 wt.% |
| Chalk ($CaCO_3$) | : | 5 - 60 wt.% |

Acid donor (citric acid 3-50% or maleic acid anhydride 5 - 30%).